COLORADO RIVER RECOVERY PROGRAM **Project No.: 22-l**
FY-2002/2003 PROPOSED SCOPE-OF-WORK

Lead Agency: SWCA, Inc., Environmental Consultants
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Category:
___ Ongoing project
___ Ongoing-revised project
_X_ Requested new project
___ Unsolicited proposal

Expected Funding Source:
_X_ Annual funds
___ Capital funds
___ Other (explain)

I. Title of Proposal:

Population estimate of humpback chub in Cataract Canyon

II. Relationship to RIPRAP:

Colorado River Action Plan: Mainstem

V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management)
V.C. Estimate humpback chub populations
V.C.3 Cataract Canyon

III. Study Background/Rationale and Hypotheses:

The Upper Colorado River Endangered Fish Recovery Program (UCRRP) is currently assisting Region 6 of the U.S. Fish and Wildlife Service (Service) in developing recovery goals for the four Colorado River endangered fishes, including the humpback chub (*Gila cypha*), Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), and bonytail (*Gila elegans*). Achievement of the recovery goals for humpback chub will be determined in part by monitoring the six known self-sustaining populations in the upper and lower Colorado River basins to ensure that each population is stable or increasing. These populations include Black Rocks, Westwater Canyon, Desolation/Gray Canyons, Yampa Canyon, Cataract Canyon, and Grand Canyon. The period of monitoring for downlisting is 5 years, in which at least three reliable population estimates will be taken for each of the six populations. The period of monitoring for delisting is 3 years beyond downlisting, in which at least one reliable population estimates will be taken for each of the six populations.

Sampling in Cataract Canyon began in 1979 under the Service's Colorado River Fishery Project (Valdez et al. 1981), then continued under the U.S. Bureau of Reclamation contracted studies with Bio/West (Valdez 1990). Starting in 1990, sampling has been conducted intermittently by the Utah Division of Wildlife Resources (UDWR). This sampling includes annual monitoring of the fish community in Cataract Canyon that was added to the Interagency Standardized Monitoring Program (ISMP) beginning in 1998. The catch rates observed during these studies were highly variable, and the population size could not be determined from these data.

A minimum of two sampling passes are required for a mark/recapture population estimate. However, it has been determined in previous studies conducted within and outside the UCRRP that three passes will provide a more precise estimate (Riley and Fausch 1992; Osmundson and Burnham 1996). Additional trips beyond three passes may provide a more precise estimate, but additional sampling increases effort and overall cost of the project. In mark/recapture population estimates, as in any statistical exercise, the larger the sample size, the more precise the estimate. The target number of fish captured in the first pass should be about 10-20% of the total estimated population. As the population size is not known until the population estimate is determined, the number of captures necessary is speculative. However, using the estimate of 500 adult HBC > 200 mm TL in Cataract Canyon (U.S. Fish and Wildlife Service 2001; from data collected by Valdez [1990]), a minimum of 50 fish captures would be required, with greater precision as that number increases. However, that estimate (500 adult HBC > 200 mm TL) was made using a 'best guess' based on captures and low numbers of recaptures over several years. Recent captures of humpback chub in Cataract Canyon in 4 days of sampling have been fewer than ten. Every effort will be made to maximize the number of humpback chub captured and marked; however, it is expected that low captures and recaptures of humpback chub in Cataract Canyon will result in estimates with large confidence intervals.

This project provides further opportunity to relate the resulting population estimates over time to long-term catch rates that are generated under such protocols as those of the historic ISMP. This analysis is being conducted in conjunction with the humpback chub population estimates for

Westwater Canyon and Desolation Canyon. Such analyses will provide important information to recovery program partners for monitoring this and other species outside the scope of the UCRRP.

IV. Goals, Objectives, End Product:

Goal:

1) Estimate the Cataract Canyon humpback chub population with the greatest precision possible (i.e., smallest confidence intervals possible).

2) Transport presumed wild bonytail (*Gila elegans*) to a hatchery.

Objectives:

1) To obtain a population estimate of late juvenile/adult humpback chub in Cataract Canyon.

2) To determine if a relationship exists between ISMP catch rates and population size.

End Product:

A precise population estimate of the Cataract Canyon humpback chub population.

V. Study area:

- Three long term trend sites in Cataract Canyon (RM 212-211, RM 208.5-207, RM 207-205) and three additional elective sites (one per trip).
- Three sampling trips will be made each year, in late September and October.
- Each trip will be 9 days in duration, including two travel/rig days.

VI. Study Methods/Approach:

Study methods will be similar to those used in the Westwater Canyon, Black Rocks, and Desolation/Gray Canyons population estimates. The study design will be a multiple mark/recapture model. Three sampling trips will be made in September and October for each of 3 years. Three primary sites will be sampled that were identified by previous studies as trend sites for long-term monitoring (RM 212-211, RM 208.5-207, RM 207-205). Humpback chub captures were greatest at these trend sites during a 4-year study from 1986-1989 (Valdez 1990). Few chubs were captured outside these areas because Cataract Canyon has a high proportion of large turbulent rapids and relatively little humpback chub habitat compared to Westwater Canyon or Desolation/Gray Canyons. Cataract Canyon is 17 miles in length, from the confluence of the Green and Colorado rivers to 40' below the lake full level of Lake Powell (3700' amsl). The first

4 miles below the confluence, above all rapids, have been sampled by UDWR as part of the bonytail reintroduction monitoring and have not produced humpback chub. Of the remaining 13 miles, 6.2 are rapids, and cannot be effectively sampled. Of the remaining 7 miles between rapids, 4.5 miles are included in the sampling design as trend sites. In addition to the three primary sites, a different elective site will be sampled on each trip to identify additional primary sites that can be incorporated into the project design in future years. An additional 0.3 - 0.5 miles will be sampled at an elective site on each trip. Elective sites will be chosen based on maximum sampling distance between rapids. The three trend sites will be sampled for two nights each, and the elective sites will be sampled for one night each. A crew of seven people (3-4 biologists and 3-4 technicians) will be required on each pass.

Trammel nets and electrofishing will be used to capture juvenile and adult chubs. Chart and Lentsch (1999) found that adult chub >200 mm are better sampled with trammel nets, and juvenile chub are better sampled by electrofishing. Each site will be electrofished before nets are set. Electrofishing will be conducted using a boat-mounted unit, and will follow shorelines closely. At each site, six to eight nets will be set in the evening beginning at 1630 hrs and checked every 1.5 to 2 hours to 2230 hrs. Nets will be moved within the sample area as necessary. Chubs will be held in live cages overnight. Nets will be set again in the morning and checked through mid-morning. All chubs will be processed after the last morning net check.

All chub species will be scanned for a PIT tag and tagged if one is not detected, measured (mm), and weighed (g). All humpback chub $\geq$ 150 mm total length (TL) will be PIT-tagged. In addition, bonytail have been stocked upstream in the Green and Colorado rivers by UDWR since 1996. All chub suspected of being stocked bonytail will be scanned for a coded wire tag if a PIT tag is not detected because it is possible that some stocked bonytail will be captured.

A population estimate will be determined for each site and all sites combined for each year of the study. An attempt will be made to calibrate catch rate indices with abundance within trend sites. These catch rate indices will used to estimate abundances at elective sites. An estimate for Cataract Canyon as a whole will be extrapolated from the trend site estimates and applied to suitable habitat outside the trend sites. A statistician will be consulted to determine which population estimate model(s) best fit(s) the data (i.e., CAPTURE, White et al. 1982). Extrapolation of the data collected to the entire canyon will follow what is determined to be scientifically/statistically acceptable in the final results/conclusions of previous humpback chub population estimates (e.g. Westwater Canyon). Population estimates will be made each for adult humpback chub (i.e., fish >200 mm TL) and for subadults (i.e., fish 150-200 mm TL), in order to assess potential recruitment to the population.

Cataract Canyon is one of the last locations where wild bonytail have been captured (Valdez 1990). Thus, any wild bonytail captured in Cataract Canyon will be transported initially to Wahweap State Fish Hatchery (Wahweap) according to UCRRP protocol. Transfers to Wahweap will be done as soon as possible by a contracted helicopter that will be contacted by satellite phone immediately after capture. Transfer of bonytail from Wahweap to another hatchery facility, if necessary, will be coordinated with the Service.

VII. Task Description and Schedule:

FY2002

Task 1) Complete three sampling trips in Cataract Canyon in late September/October 2001 for a humpback chub population estimate.

Task 2) Data will be entered into a database on the computer and transferred to the UCRRP database manager by January 15, 2002.

Task 3) A short annual progress report summarizing the data will be submitted on Dec 15, 2001.

FY2003

Task 1) Complete three sampling trips (including monitoring trip) in Cataract Canyon in late September/October 2002 for a humpback chub population estimate.

Task 2) Data will be entered into a database on the computer and transferred to the UCRRP database manager by January 15, 2003.

Task 3) A short annual progress report summarizing the data will be submitted on Dec 15, 2002.

FY2004

Task 1) Complete three sampling trips in Cataract Canyon in late September/October 2003 for a humpback chub population estimate.

Task 2) Data will be entered into a database on the computer and transferred to the UCRRP database manager by January 15, 2004.

Task 3) A short annual progress report summarizing the data will be submitted on Dec 15, 2003.

Task 4) A Final Report presenting the 3-year estimate will be completed by September 30, 2004.

VIII. FY2002 Work

- Deliverables/Due Dates - See above

- Budget **(SEE ATTACHED ESTIMATED COST WORKSHEET)**:

Task 1	SWCA	UDWR
Labor	$41,040	$22,680
Travel	$500	
Equipment		$2,100
Other (supplies)		$2,750
Task 1 Total	**$41,540**	**$27,530**
Task 2		
Labor	$5,000	$500
Task 2 Total	**$5,000**	**$500**
Task 3		
Labor	$4,360	$460
Travel	$500	$500
Task 3 Total	**$4,860**	**$960**
Grand Total	**$51,400**	**$28,990**

Note: Time and materials for transport of bonytail to a hatchery have not been included in this budget, since transport may not be necessary. Each transport occasion is estimated at $2,000.00.

FY2003 Work

- Deliverables/Due Dates - See above

- Budget: Same, add 5%

FY2004 Work

- Deliverables/Due Dates - See above

- Budget: Same, add 5%, an additional $15,000 for final report

IX. Budget Summary

FY-2002	$ 80,390
FY-2003	$ 84,409
FY-2004	$103,630

X. Reviewers - Dr. Kevin Bestgen
Dr. Michael Douglas
Chuck McAda

XI. References

Chart, T.E. and L. Lentsch. 1999. Humpback Chub in Westwater Canyon. Final Report to the Colorado River Endangered Fishes Recovery Program. Utah Division of Wildlife Resources, Salt Lake City, UT.

Osmundson, D.B., and K.P. Burnham. 1996. Status and trends of the Colorado squawfish in the upper Colorado River. Final Report. Colorado River Recovery Implementation Program Project No. 14 (Part II). U.S. Fish and Wildlife Service, Grand Junction, CO.

Riley, S.C., and K.D. Fausch. 1992. Underestimation of trout population size by maximum-likelihood removal estimates in small streams. North American Journal of Fisheries Managment 12(4):768-776.

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Valdez, R.A., P. Mangan, R. Smith, B. Nilson. 1982. Upper Colorado River investigation (Rifle, Colorado to Lake Powell, Utah). Pages 100–279 *in* U.S. Fish and Wildlife Service. Colorado River Fishery Project, Final Report, Part 2: Field Investigations. U.S. Fish and Wildlife Service, Salt Lake City, Utah.

Valdez, R.A. 1990. The endangered fish of Cataract Canyon. Bio/West Report No. 134-3 to Bureau of Reclamation, Salt Lake City, UT.

White, G.C., D.R. Anderson, K.P. Burnham, and D.L. Otis. 1982. Capture-recapture and removal methods for sampling closed populations. Los Alamos National Laboratory LA-8787-NERP, UC-11, Los Alamos, NM.

ESTIMATED COST WORKSHEET

FY 2002 - TASK 1 (3 SAMPLING TRIPS)

TRIP 1

Name	Days	Hours	Rate	Cost	SWCA	UDWR	RAVA
R. Valdez	9	72	$75.00	$5,400.00			$5,400.00
M. Trammel	9	72	$70.00	$5,040.00	$5,040.00		
M. Hudson	9	72	$45.00	$3,240.00		$3,240.00	
S. Meismer	9	72	$35.00	$2,520.00		$2,520.00	
Technician	9	72	$35.00	$2,520.00	$2,520.00		
Technician	9	72	$35.00	$2,520.00	$2,520.00		
Technician	9	72	$19.00	$1,368.00		$1,368.00	
				$22,608.00			

TRIP 2

Name	Days	Hours	Rate	Cost			
R. Valdez	0	72	$75.00	$5,400.00			$5,400.00
M. Trammel	9	72	$70.00	$5,040.00	$5,040.00		
M. Hudson	9	72	$45.00	$3,240.00		$3,240.00	
S. Meismer	9	72	$35.00	$2,520.00		$2,520.00	
Technician	9	72	$35.00	$2,520.00	$2,520.00		
Technician	9	72	$35.00	$2,520.00	$2,520.00		
Technician	9	72	$19.00	$1,368.00		$1,368.00	
				$22,608.00			

TRIP 3

Name	Days	Hours	Rate	Cost			
R. Valdez	0	0	$75.00	$0.00			$0.00
M. Trammel	9	72	$70.00	$5,040.00	$5,040.00		
M. Hudson	9	72	$45.00	$3,240.00		$3,240.00	
S. Meismer	9	72	$35.00	$2,520.00		$2,520.00	
Technician	9	72	$35.00	$2,520.00	$2,520.00		
Technician	9	72	$35.00	$2,520.00	$2,520.00		
Technician	9	72	$19.00	$1,368.00		$1,368.00	
Technician	9	72	$18.00	$1,296.00		$1,296.00	
				$17,208.00			
				$62,424.00	$30,240.00	$22,680.00	$10,800.00

Travel

SWCA				$300.00	$300.00		

UDWR	$0.00	$0.00	
RAVA	$200.00		$200.00
Other Costs			
Equipment	$2,100.00	$2,100.00	
Supplies	$2,750.00	$2,750.00	
	$30,540.00	$27,530.00	$11,000.00

TOTAL ESTIMATED COST OF TASK 1: $69,070.00

FY 2002 - TASK 2 (DATA ENTRY)

TRIP 1

Name	Days	Hours	Rate	Cost	SWCA	UDWR	RAVA
R. Valdez		0	$75.00	$0.00			$0.00
M. Trammel		24	$70.00	$1,680.00	$1,680.00		
M. Hudson		5	$45.00	$225.00		$225.00	
S. Meismer		8	$35.00	$280.00		$280.00	
Technician		60	$35.00	$2,100.00	$2,100.00		
Technician		35	$35.00	$1,225.00	$1,225.00		
Technician		0	$19.00	$0.00		$0.00	
				$5,510.00			
					$5,005.00	$505.00	$0.00

TOTAL ESTIMATED COST OF TASK 2: $5,510.00

FY 2002 - TASK 3 (ANNUAL PROGRESS REPORT)

TRIP 1

Name	Days	Hours	Rate	Cost	SWCA	UDWR	RAVA
R. Valdez		20	$75.00	$1,500.00			$1,500.00
M. Trammel		48	$70.00	$3,360.00	$3,360.00		
M. Hudson		12	$45.00	$540.00		$540.00	
S. Meismer		12	$35.00	$420.00		$420.00	
Technician		0	$35.00	$0.00	$0.00		
Technician		0	$35.00	$0.00	$0.00		
Technician		0	$19.00	$0.00		$0.00	
				$5,820.00			
					$3,360.00	$960.00	$1,500.00

TOTAL ESTIMATED COST OF TASK 3: $5,820.00

TOTAL ESTIMATED COST FOR FY 2002: $80,390.00

TOTAL ESTIMATED COST FOR FY 2003 (FY 2002 + 5%): $84,409.00

TOTAL ESTIMATED COST FOR FY 2004 (FY 2003 + 5% + $15,000): $103,630.00
(See FY 2004, Task 4 Final Report Budget Below)

FY 2004 - TASK 4 (FINAL REPORT)

TRIP 1

Name	Days	Hours	Rate	Cost	SWCA	UDWR	RAVA
R. Valdez		40	$75.00	$3,000.00			$3,000.00
M. Trammel		100	$70.00	$7,000.00	$7,000.00		
M. Hudson		40	$45.00	$1,800.00		$1,800.00	
S. Meismer		20	$35.00	$700.00		$700.00	
Statistician		24	$75.00	$1,800.00	$1,800.00		
Technician		20	$35.00	$700.00	$700.00		
Technician		0	$19.00	$0.00		$0.00	
				$15,000.00			
					$9,500.00	$2,500.00	$3,000.00

TOTAL ESTIMATED COST OF TASK 4: $15,000.00